International Journal of Soft Computing and Engineering (IJSCE)
ISSN: 2231-2307, Volume-2 Issue-2, May 2012

Study of Broadcasting and Its Performance Parameter in VANET

Yashpal Singh, Anurag Sharma

Abstract:- A Vehicular Ad-Hoc Network is a kind of ad-hoc network, and is a self-configuring network of vehicular routers connected by wireless links. Vanet presents new and promising field of research, development and standardization. Vehicular Ad-Hoc Network is a wireless network without infrastructure. Reliable broadcasting in vehicular ad-hoc networks is one of the keys to success for services and applications on intelligent transportation system. Broadcasting in VANET is very different from routing in mobile ad hoc network (MANET) due to several reasons such as network topology, mobility patterns, demographics, traffic patterns at different time of the day, etc. In this paper we report the broadcasting in VANET, three very different regimes that a vehicular broadcasting protocol needs to work and the performance parameter of broadcasting in VANET.

I. INTROODUCTION

Broadcasting in wireless networks can serve numerous applications where reliability is not necessary and time is not a critical requirement.The emergence of VANETs opened a new research challenge of time-critical reliable broadcasting that intended to serve a bunch of public safety related applications One of the challenges posed by this type of networks is the confinement of the routing problem to vehicle-to-vehicle scenarios as opposed to also utilizing the wireless infrastructure (cellular network). At a Conceptual level, safety and transport efficiency is a essential for car vendors and this has to be provided by the cars on the road as opposed to also using the existing wireless communications infrastructure. Applications with this world constraint (rules) call for a new routing protocol for vehicular broadcasting in VANET.

In this paper, we report the comprehensive study on the topic whereby the extreme traffic situation such as dense traffic, sparse traffic density, and low penetration of cars using Dedicated short range communications technology are specifically taken into consideration.

The remainder of this paper is organized as follows. Section 2 presents different areas of interest in VANET that the designed broadcast protocol should be able to handle. Section 3 discusses some performance parameters.

II. REGIMES FOR BROADCASTING IN VANET

The three different regimes of operation in VANET are:

A) Dense Traffic
B) Sparse Traffic
C) Regular Traffic

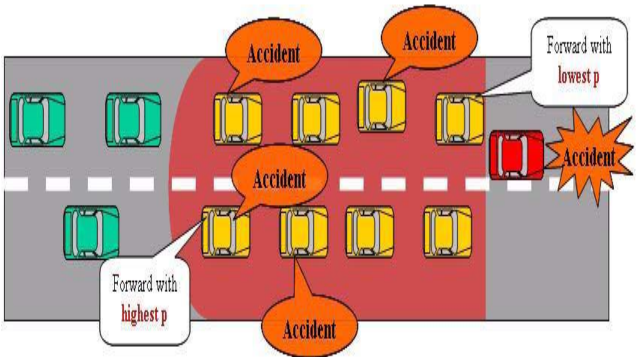
The first two of these three cases correspond to extreme situations. It is important and good to understand the properties of these three regimes as a good broadcast routing protocol has to be able to deal with all these three regimes. We give a brief overview of these regimes.

A) Dense Traffic

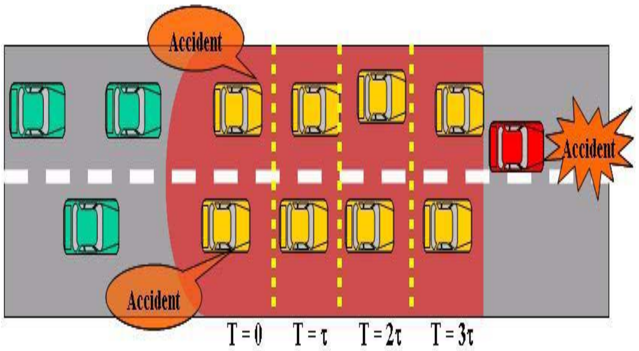
When a traffic density value is above a certain value, the most serious problems is the choking of the shared medium by an excessive number of the same safety broadcast message by several consecutive cars. Because of the shared wireless medium, carelessly broadcasting the packets may leads to regular contention and collisions in transmission of data among neighboring nodes. The problem is called generally as broadcast storm problem[1]. There are many solutions exists to decrease the effect of broadcast storm problem in a usual MANET environment, only a few solutions exist for solving this issue in the VANET context. There are normally three broadcast techniques; i.e., weighted p-persistence, slotted 1-persistence, and slotted p-persistence, which can provide 100% reachability in a well-connected network and up to 70% reduction in the broadcast redundancy and packet loss ratio on a well-connected vehicular network.
Figure 1 shows three distance based scenarios
i) Weighted p-Persistence Broadcasting
ii) Slotted 1-Persistence Broadcasting
iii) p-Persistence Broadcasting

The broadcast techniques generally follows either a 1-persistence or a p-persistence rule. Despite the excessive overhead, most of the routing protocols designed for multi-hop ad hoc wireless networks follow the brute-force 1-persistence flooding rule which essentially requires that all nodes rebroadcast the packet with probability 1 because of the low complexity and high packet penetration rate. Gossip-based approach, follows the p-persistence rule which requires that each node re-forwards with a pre-determined probability p. This principle is sometimes called as probabilistic flooding. The slotted p-persistence scheme can reduce the packet loss ratio at the expense of a slight increase in total delay and reduced penetration rate.

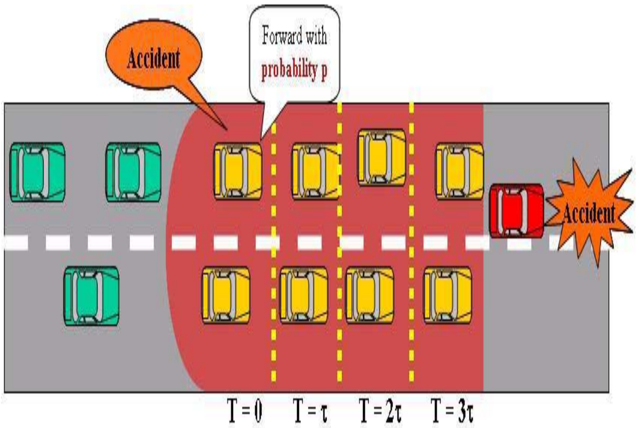
Manuscript received on April 26, 2012.
Er. Anurag Sharma, Assistant Professor, FET, Agra College Agra, India.



(a) Weighted p-persistence



b) Slotted 1-persistence scheme



(c) Slotted p-persistence scheme.

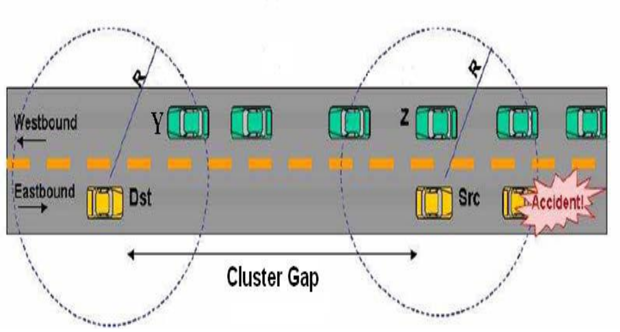
Fig.1. Broadcast Suppression Techniques

B) **Sparse Traffic**

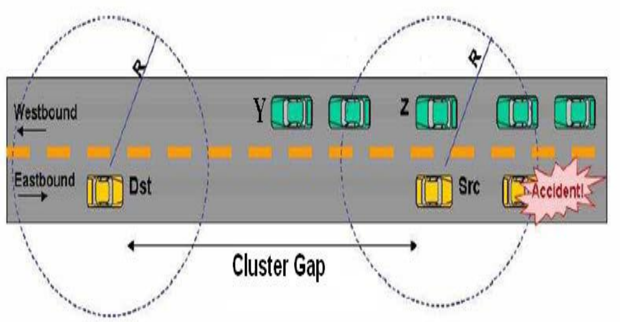
The other extreme situations, which is very troublesome for standard routing protocols, is the case where there are less no of vehicles on the road. At certain point of time of the day the traffic might be so low that multi-hoc relaying from a source to the cars coming from behind might not be plausible because the target node might be out of the transmission range of the source. To make the situation worst, there might be no car within the transmission range of the source in the opposite lane. Under such situations, routing and broadcasting becomes a difficult task. there are several routing techniques which address the sparsely connected nature of the mobile wireless networks, e.g., Epidemic routing[2], Single-copy[3], Multi-copy 'Spray and Wait'[4], there are only a few that considered a VANET topology.

C) **Regular Traffic**

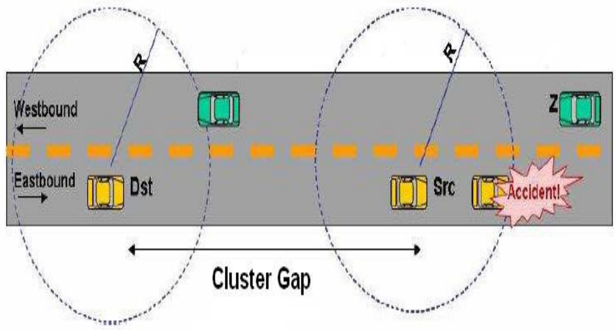
For both sparse and dense traffic situations previously discussed, it is likely that the local connectivity experienced by each vehicle in a network would also reflect the global connectivity, e.g., a vehicle in a busy network is likely to observe a dense local topology while vehicles in a sparse network are likely to have null or only a less neighbors or observe a sparse local topology. Specifically, all vehicles operating in these two extreme regimes will observe the same local topology which also reflects the real global topology, i.e., some may have very few neighbors while some have many neighbors. In such situations, some vehicles will have to apply the broadcast suppression algorithm while some will have to save-carry-forward the message in order to preserve the network operability.



(a) Best case scenario: packet can immediately be relayed to the target vehicles via vehicles in the opposite traffic



(b) Intermediate case scenario: vehicles in the opposite direction is responsible for store-carry-forward the message back to vehicles in the message forwarding road



(c) Worst case Scenario: packet cannot immediately be relayed to vehicles in the opposite direction

Fig.2. Illustration of the disconnected VANETs

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

III. PERFORMANCE PARAMETER

The three performance parameters, which are considered for performance evaluation:

A) Reliability
B) Overhead
C) Speed of Data Dissemination

Reliability: It is measured as a percentage of number of nodes that received the message at the end of simulation.

Overhead: It is measured from bandwidth consumption which is from messages transmission and beaconing transmission. Beacon size includes node's local information (e.g., identifier, position and velocity) and list of received messages identifiers as acknowledgement.

Speed of Data Dissemination: It is measured as given in below equation,

$$y(t) = \sum_{i=1}^{t} \frac{(r_i)}{n} * 100$$

Where r_i represents number of node that received the message for the first time at the time I and n is the total number of vehicles in the scenario.

IV. CONCLUSION

VANET helps ITS applications and services to be able to exchange and distinguish data easily and fastly. Most of these applications and services rely on efficient and fast reliable broadcasting protocol to provide accurate information. The three different regimes which we have discussed in this paper to precisely say, the names of regimes of operation in VANET are Dense Traffic Regimes, Sparse Traffic Regimes, and Regular Traffic Regimes .These have been discussed in the paper to define the extreme traffic situation. The first two of these three cases correspond to extreme scenarios. It is important and meaningful to understand the characteristic properties of these three regimes as a good broadcast routing protocol has to be able to deal with all these three regimes. We have also described the three performance parameters, namely Reliability, Overhead, and Speed of Data Dissemination, which evaluate the performance of the protocol, working for reliable broadcasting.

REFERENCES

1. S. Ni, Y. Tseng, Y. Chen, and J. Sheu, "The broadcast storm problem in a mobile ad hoc network," in *Proc. ACM Intern. Conf. on Mobile Comput. and Networking* (MOBICOM), Seattle, USA, 1999, pp. 151–162.
2. A. Vahdat and D. Becker, "Epidemic routing for partially connected ad hoc networks," Duke University, Tech. Rep., April 2000, cS-200006.
3. T. Spyropoulos, K. Psounis, and C. S. Raghavendra, "Single-copy routing in intermittently connected mobile networks," in *The 1st IEEE Comm. Society Conf. SECON'04*, October 2004.
4. "Spray and wait: An efficient routing scheme for intermittently connected mobile networks," in *WDTN*, 2005.
5. Dr. Yashpal Singh Head Dept. of Computer Science /IT, BIET, Jhansi. Published 15 research papers and attented number of seminars/workshops all around the country.email-yash_biet@yahoo.co.in,09415030602

AUTHORS PROFILE

Er. Anurag Sharma, (B.E,M.E) Assistant Professor, FET, Agra College Agra with excellent academic record at UG and PG level.Published 2 national papers and attented short term courses at IIT Guwahati and at other good institutions and colleges.email-anurag121097@rediffmail.com,9837268292.

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication